In the Claims:

1. (Original): A method of optical imaging comprising:

providing a sample to be imaged;

measuring and correcting aberrations associated with the sample using adaptive optics;

and imaging the sample by optical coherence tomography (OCT).

2. (Original): The method of claim 1, wherein the aberrations associated with the sample are measured and corrected by (i) illuminating the sample with a point source light beam having a wavefront, (ii) detecting the wavefront of the point source light beam that is reflected from the sample with a wavefront sensor to measure wavefront distortions of the sample, and (iii) adjusting a wavefront corrector so as to compensate for the wavefront distortions that are associated with the sample.

3. (Original): The method of claim 2, wherein steps (i)-(iii) are repeated in a closed loop until the wavefront corrector imparts a shape onto the wavefront that is identical, but opposite in sign to, the measured wavefront distortion.

4. (Original): The method of claim 1, wherein the sample is imaged by (iv) generating a beam of low temporal coherence two-dimensional (2D) OCT light from a light source, (v) splitting the beam of low temporal coherence light to create a sample light beam and a reference light beam, each having an optical path length corresponding to a coherence gate position at a desired region of the sample to be imaged, (vi) illuminating the sample with the sample light beam, (vii) illuminating a reference mirror with the reference light beam, (viii) superimposing the reflected sample light beam and reflected reference light beam to

obtain an interference pattern corresponding to the coherence gate position, (ix) recording the interference pattern using a detector, (x) generating a two-dimensional image of the sample from the interference pattern.

Claim 5. (Original): The method of claim 4, further comprising the steps of (xi) changing the optical path length to generate a series of coherence gate positions within the sample, (xii) recording a series of interference patterns and generating a series of corresponding twodimensional images from the interference patterns, and (xiii) constructing a three dimensional image of the sample from the two-dimensional images.

Claim 6. (Original): The method of claim 4, wherein the sample is illuminated by a scanning point light source.

Claim 7 (Original): The method of claim 4, wherein the sample is illuminated by a flood illumination light source.

Claim 8 (Original): The method of claim 2, wherein the sample is imaged by (iv) generating a beam of low temporal coherence two-dimensional (2D) OCT light from a light source, (v) splitting the beam of low temporal coherence light to create a sample light beam and a reference light beam, each having an optical path length corresponding to a coherence gate position at a desired region of the sample to be imaged, (vi) illuminating the sample with the sample light beam, (vii) illuminating a reference mirror with the reference light beam, (viii) superimposing the reflected sample light beam and reflected reference light beam to obtain an interference pattern corresponding to the coherence gate position, (ix) recording the

interference pattern using a detector, (x) generating a two-dimensional image of the sample from the interference pattern.

Claim 9. (Original): The method of claim 8, further comprising the steps of (xi) changing the optical path length to generate a series of coherence gate positions within the sample, (xii) recording a series of interference patterns and generating a series of corresponding twodimensional images from the interference patterns, and (xiii) constructing a three dimensional image of the sample from the two-dimensional images.

Claim 10. (Original): The method of claim 8, wherein steps (i)-(iii) are completed prior to step (ix).

Claim 11. (Original): The method of claim 8, wherein steps (i)-(iii) are RU-ther carried out concurrently with steps (iv)-(ix).

Claim 12. (Original): The method of claim 8, wherein the method fin-ther comprises tracking and compensating for axial motion of the sample by:

generating a beam of low temporal coherence 1D-OCT light from a light source,

splitting the beam of low temporal coherence lD-OCT light to create a 1DOCT sample light beam and a 1D-OCT reference light beam, each having an optical path-length corresponding to a coherence gate position at a desired region of the sample to be imaged,

illuminating the sample with the 1D-OCT sample light beam,

illuminating the reference mirror with the lD-OCT reference light beam,

superimposing the reflected sample light beam and reflected reference light beam to obtain an interference pattern corresponding to the coherence gate position,

recording a series of interference patterns corresponding to a series of coherence gate positions using a 1D-OCT detector,

determining a change in axial position of the sample by analyzing the interference patterns recorded by the lD-OCT detector,

and adjusting the optical path length of the reference light beam so as to axially move the coherence gate position of the sample light beam thereby compensating for the measured axial motion of the sample.

Claim 13. (Original): The method of claim 12, wherein the method of tracking and compensating for axial motion of the sample is completed prior to step (ix).

Claim 14. (Original): The method of claim 12, wherein the method of tracking and compensating for axial motion of the sample is carried out prior to and concurrently with steps (iv)-(ix).

Claim 15. (Original): The method of claim 12, wherein the sample is an eye and the change in axial position is analyzed using a portion of the 1 D-OCT low temporal coherence light that is reflected off of a region of the eye selected from the group consisting of a choriod layer, a retinal pigment epithelium layer, and a front layer of a retina.

Claim 16. (Original): The method of claim 1, wherein the method further comprises:

illuminating the sample with a low coherent flood illumination light source to focus on a region of the sample,

detecting the low coherent flood illumination light that is reflected from the sample with a low coherent flood illumination light detector,

and optionally adjusting the focus within the sample to image at a plurality of depths in the sample.

Claim 17. (Original): The method of claim 16, wherein the low coherent flood illumination light source has low temporal coherence, low spatial coherence, or both low temporal and low spatial coherence.

Claim 18. (Original): The method of claim 16, wherein the low coherent flood illumination light detector is the same as the 2D-OCT detector.

Claim 19. (Original): The method of claim 1, wherein the sample is an eye.

Claim 20. (Original): The method of claim 19, wherein the sample is retinal or fundus tissue.

Claim 21. (Original): The method of claim 4, wherein the two-dimensional image of the sample is used to provide diagnostic information about a retinal pathology selected from the group consisting of macular degeneration, retinitis pigmentosa, glaucoma, and diabetic retinopathy.

Claim 22. (Original): An optical imaging apparatus comprising an adaptive optics (AO) subsystem and a two-dimensional optical coherence tomography (2D-OCT) subsystem.

Claim 23. (Original): The optical imaging apparatus of claim 22, wherein the AO subsystem comprises (a) a point light source for adaptive optics, (b) a wavefront sensor, and (c) a wavefront corrector.

Claim 24. (Original): The apparatus of claim 23, wherein the point light source is selected from the group consisting of a laser diode, a superiuminescent diode, and a light emitting diode.

Claim 25. (Original): The apparatus of claim 23, wherein the wavefront sensor is a Shack-Hartmann wavefront sensor.

Claim 26. (Original): The apparatus of claim 23, wherein the wavefront corrector is selected from the group consisting of a deformable mirror, a bimorph mirror, a membrane mirror, a liquid crystal spatial light modulator, and a micro-opto-electro-mechanical system.

Claim 27. (Original): The apparatus of claim 26, wherein the wavefront corrector is a liquid crystal spatial light modulator or a micro-opto-electro-mechanical system.

Claim 28. (Original): The optical imaging apparatus of claim 22, wherein the 2D-OCT subsystem comprises (d) a 2D-OCT low temporal coherence light source, (e) a beam splitter, (f) a reference mirror, (g) a means of modulating an optical path length of a reference beam, and (h) a 2D-OCT detector.

Claim 29. (Original): The apparatus of claim 28, wherein the low temporal coherence light source is a flood illumination source.

Claim 30. (Original): The apparatus of claim 28, wherein the low temporal coherence light source is a scanning point source.

Claim 31. (Original): The apparatus of claim 28, wherein the low temporal coherence light source is selected from the group consisting of white light sources(e.g., halogen sources, arc lamps, or flashlamps), semiconductor sources (e.g., SLD, LED, doped fiber sources, multiple quantum well semiconductor optical amplifiers) or solid state lasers (e.g., femtosecond lasers).

Claim 32. (Original): The apparatus of claim 3 1, wherein the low temporal coherence light source is a superluminescent diode.

Claim 33. (Original): The apparatus of claim 28, wherein the low temporal coherence light source has a wavelength of about 0.4 microns to about 1.6 microns.

Claim 34. (Original): The apparatus of claim 28, wherein the 2D-OCT detector is selected from a CCD detector, an intensified CCD detector, a CMOS detector,photodiode, photodiode array, or an active pixel array.

Claim 35. (Original): The apparatus of claim 34, wherein the 2D-OCT detector is an active pixel array.

Claim 36 (Orignal): The apparatus of claim 22, further comprising a one-dimensional optical coherence tomography (lD-OCT) axial scanning subsystem comprising a low temporal coherence lD-OCT light source and a 1D-OCT detector.

Claim 37. (Original): The apparatus of claim 22, further comprising a low coherence flood illumination light source.

Claim 38. (Original): The apparatus of claim 37, wherein the low coherence flood illumination light source is selected from the group consisting of a laser diode, a femtosecond laser, a mode-locked solid state laser, a dye laser, a superluminescent diode, and a light emitting diode.

Claim 39. (Original): The apparatus of claim 38, wherein the low coherence flood illumination light source is coupled to a multi-mode fiber.

Claim 40. (Original): A method of optically imaging a sample comprising: correcting aberrations associated with the sample by:

(i) illuminating the sample with a point source light beam having a wavefront,

(ii) detecting the wavefront of the point source light beam that is reflected from the sample with a wavefront sensor to measure wavefront distortions of the sample, and

(iii) adjusting a wavefront corrector so as to compensate for the wavefront distortions that are associated with the sample; tracking axial motion of the sample by:

(iv) generating a beam of low temporal coherence 1D-OCT light from a light source,

(v) splitting the beam of low temporal coherence 1D-OCT light to create alD-OCTsainplelightbearnanda1D-OCTreferencelightbeam,eachhavingan optical path length corresponding to a coherence gate position at a desired region of the sample to be imaged,

(vi) illuminating the sample with the lD-OCT sample light beam,

(vii) illuminating the reference mirror with the 1D-OCT reference light beam,

(viii) superimposing the reflected sample light beam and reflected reference light beam to obtain an interference pattern corresponding to the coherence gate position,

(ix) recording a series of interference patterns corresponding to a series of coherence gate positions using a 1D-OCT detector,

(x) determining a change in axial position of the sample by analyzing the interference patterns recorded by the lD-OCT detector, and

(xi) adjusting the optical path length of the reference light beam so as to axially move the coherence gate position of the Sample light beam thereby compensating for the measured axial motion of the sample; targeting a region of the sample to be imaged by:

(xii) illuminating the sample with a low coherent flood illumination light source to focus on a region of the sample,

(xiii) detecting the low coherent flood illumination light that is reflected from the sample with a low coherent flood illumination light detector, and

(xiv) optionally adjusting the focus within the sample to image at a plurality of depths in the sample; and producing an optical image of the sample by:

(xv) generating a beam of low temporal coherence 2D-OCT light from a light source,

(xvi) splitting the beam of low temporal coherence light to create a sample light beam and a reference light beam, each having an optical path length corresponding to a coherence gate position at a desired region of the sample to be imaged,

(xvii) illuminating the sample with the sample light beam,

(xviii) illuminating a reference mirror with the reference light beam,

(xix) superimposing the reflected sample light beam and reflected reference light beam to obtain an interference pattern corresponding to the coherence gate position,

(xx) recording the interference pattern using a 2D-OCT detector, and

(xxi) generating a two-dimensional image of the sample from the interference pattern.

Claim 41. (Original): An optical imaging apparatus comprising (a) a point light source for adaptive optics, (b) a Shack-Hartmann wavefront sensor, (c) a wavefront corrector, (d) a low temporal coherent superluminescent diode 2D-OCT light source, (e) a beam splitter, (f) a reference mirror, (g) a means of modulating an optical path length of a reference beam, (h) a 2D-OCT CCD detector, (i) a 1D-OCT low temporal coherence superluminescent diode light source, 0) a 113-OCT detector, and (k) a low coherent flood illumination light source coupled to a multi-mode fiber.

Claim 42. (New) A method for optically imaging a sample of retinal or fundus tissue in an eye, the method comprising:

(a) providing an optical imaging system comprising an adaptive optical element;

(b) measuring wavefront aberrations in the eye;

(c) controlling the adaptive optical element to correct the wavefront aberrations measured in step (b);

(d) performing a first optical coherence tomography operation on the sample to determine a distance from the sample to the optical imaging system;

(e) adjusting the optical imaging system to compensate for the distance determined in step (d); and

(f) performing a second optical coherence tomography operation on the sample to image the sample.

Claim 43. (New) The method of claim 42, wherein the second optical coherence tomography operation is a two-dimensional optical coherence tomography operation.

Claim 44. (New) The method of claim 43, wherein the first optical coherence tomography operation is a one-dimensional optical coherence tomography operation.

Claim 45. (New) The method of claim 43, wherein the two-dimensional optical coherence tomography operation comprises flood illumination of the sample.

Claim 46. (New) The method of claim 42, further comprising, before step (f):

(g) illuminating the sample with low coherent flood illumination light;

(h) detecting the low coherent flood illumination light reflected from the sample; and

(i) adjusting a focus of the optical imaging system in accordance with the low coherent flood illumination light detected in step (h).

Claim 47. (New) The method of claim 46, wherein a single detector in the optical imaging system is used to perform steps (f) and (h).

Claim 48. (New) A method for optically imaging a sample of retinal or fundus tissue in an eye, the method comprising:

(a) providing an optical imaging system comprising an adaptive optical element;

(b) measuring wavefront aberrations in the eye;

(c) controlling the adaptive optical element to correct the wavefront aberrations measured in step (b);

(d) illuminating the sample with low coherent flood illumination light;

(e) detecting the low coherent flood illumination light reflected from the sample; and

(f) adjusting a focus of the optical imaging system in accordance with the low coherent flood illumination light detected in step (e); and

(g) performing an optical coherence tomography operation on the sample to image the sample;

wherein a single detector in the optical imaging system is used to perform steps (e) and (g).

Claim 49. (New) The method of claim 48, wherein step (d) is performed with a light source coupled to a multimode optical fiber.

Claim 50. (New) The method of claim 49, wherein the light source comprises a laser diode.

Claim 51. (New) The method of claim 49, wherein the light source comprises a superluminescent diode.

Claim 52. (New) A method for optically imaging a sample of retinal or fundus tissue in an eye, the method comprising:

(a) providing an optical imaging system comprising an adaptive optical element;

(b) measuring wavefront aberrations in the eye;

(c) controlling the adaptive optical element to correct the wavefront aberrations measured in step (b);

(d) illuminating the sample with low coherent flood illumination light by using a light source coupled to a multimode optical fiber;

(e) detecting the low coherent flood illumination light reflected from the sample; and

(f) adjusting a focus of the optical imaging system in accordance with the low coherent flood illumination light detected in step (e); and

(g) performing an optical coherence tomography operation on the sample to image the sample.

Claim 53. (New) The method of claim 52, wherein the light source comprises a laser diode.

Claim 54. (New) The method of claim 52, wherein the light source comprises a superluminescent diode.

Claim 55. (New) A method for optically imaging a sample of retinal or fundus tissue in an eye, the method comprising:

(a) providing an optical imaging system comprising an adaptive optical element;

(b) measuring wavefront aberrations in the eye;

(c) controlling the adaptive optical element to correct the wavefront aberrations measured in step (b); and

(d) performing an optical coherence tomography operation on the sample to image the sample, wherein step (d) is performed using an active pixel array.

Claim 56. (New) The method of claim 55, wherein step (d) comprises beat frequency detection.